Third United Nations International Conference on the Peaceful Uses of Atomic Energy

A/CONF.28/A/785
INDIA
February 1964
Original: ENGLISH

Confidential until official release during Conference

Abstract

# A FEASIBILITY STUDY OF NON-DESTRUCTIVE ASSAY OF PLUTONIUM 239 IN IRRADIATED FUEL RODS USING SLOWING DOWN TIME SPECTROMETER

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In the region of 0.01 eV to 1.0 eV the fission cross-sections of U235 and $Pu_{239}$ are similar except at 0.3 eV where Pu239 has a resonance peak whose value is twenty times that of $U_{235}$. This difference is used to determine the plutonium content by measuring the relative macroscopic cross-sections as a function of energy in this energy range. Neutrons of various energies are selected using the large slowing down time and the small energy spread of neutrons slowing down in a heavy moderator.

To test the feasibility of the method, a slowing down time spectrometer has been constructed using about 100 tons of lead (200 x 200 x 190 cms) and a low voltage pulsed accelerator using the (d,t) reaction as a neutron source.

In the experiment, pulses of fast neutrons are injected periodically into the lead assembly. The mean energy and energy spread of the slowing down neutrons are known functions of time. The fast neutrons due to fission in samples of Plutonium and Uranium are measured as a function of slowing down time and hence of energy by using a fast neutron detector with a time analyser. The neutron density at the same point is similarly measured by means of a $BF_3$ proportional counter.

Results so far obtained indicate that the method is feasible.